TRANSLATION INTO ENGLISH OF ORIGINAL SPECIFICATION, CLAIMS AND ABSTRACT OF INTERNATIONAL APPLICATION AS PUBLISHED

HIGH TENSION TRANSFORMER

OBJECT OF THE INVENTION

The invention that is being dealt with consists in a high tension transformer the goal of which is to considerably reduce the size and the price thereof.

Obviously, the invention can be used in all those applications where a high kilovoltage supply is being required, both in direct and in high or low frequency alternate current.

BACKGROUND OF THE INVENTION

Conventionally, the use of high kilovoltage transformers the design of which presents a maximum difficulty in achieving the electrical insulation between the various elements (transformers, high tension switches, rectifiers, tension dividers, dischargers, etc.) they are composed of, is more than known. Insulation thereof is conventionally made by three different manners:

1. Filling, at vacuum and in a dry environment, the whole inside of the tank or housing containing the various elements of the transformer with a liquid or gaseous fluid which is usually silicone oil or mineral oil due to the low cost thereof.

2. Using solid insulating parts as there are plastics, glasses, porcelains, resins, etc.

3. Vacuum encapsulating the whole assembly with high tension insulating silicones or resins.

In any of these three manners of making the insulation, it is necessary to keep some minimum distances between the various elements composing the transformer. This minimum distance depends on the voltage applied between the various elements so that it is necessary to keep a minimum insulation distance between the points of major tension, which involves in the majority of the cases, the insulation distance becomes excessive for achieving insulation between the points of minor tension.

The final consequence is that the elements occupy a very high volume, whereby this volume must moreover be covered with the insulating material, a fact which considerably increases the weight and, especially, increases the cost of the transformer.

Furthermore, this design for achieving minimum distances, renders the assembly of the various elements of the transformer difficult, a fact which equally increase its cost.

DESCRIPTION OF THE INVENTION

To solve the afore indicated inconveniences, the invention has developed a new high tension transformer which is characterized in that the conventional elements it is constituted of are arranged in two differentiated groups, on the one hand the elements having positive voltage and, on the other, the elements having negative voltages, both groups being separated by insulating means.

Furthermore, the arrangement of the elements provides that they are advantageously designed in such a manner that one of the ends of all thereof, have ground level or "zero" voltage. This voltage progressively increases towards the opposed end in the elements having positive voltages, and progressively decreases in the elements having negative voltages; all this in such a manner that, at an equal level or distance from ground level, the elements of each group have equipotential voltages.

This structure has the great advantage that the elements of one same group do not need insulation between themselves, so that the distance which is to separate them is considerably reduced, and, furthermore, the elements occupying the same area of potential do not at all have an influence on the stray capacitance, so that there are no limitations neither in respect of their proximity nor in respect of the opposed surfaces between them.

Thus, by means of the invention, as the elements are

designed such that their voltage levels are in accordance with the area of potential which they occupy, it is possible to bring the elements nearer to each other, so that the volume is considerably reduced and, thus, the insulator filling the inside of the housing or tank of the transformer, is considerably reduced.

As a consequence of this reduction of the volume, a considerable reduction of the weight is achieved, due to that the tank is of smaller dimensions and a smaller quantity of filling insulator is required.

Another of the advantages of the present invention is the reduction of the stray capacitance which eliminates some undesirable side effects.

The progressive increase of the tension in the elements having a positive voltage, and the progressive decrease of the tension in the elements having a negative voltage, are linear.

Advantageously, the ground level or "zero tension", is located in correspondence with the low tension input signals.

In a preferred embodiment, the "zero tension" level is located on the upper side of the transformer, such that the maximum level of potential is defined at the lower ends of the high tension switches.

The insulating means separating the two groups of elements, are established by one single insulating barrier, a fact which considerably simplifies the assembly of the various elements of the transformer at the same time as it reduces its cost.

Another feature of the invention resides in the fact that it has means for minimizing the stray capacitance between the elements of one group and the other. These means are determined by the arrangement presented by the various elements of one group and the other, such that they are located that the opposed surface of the elements

of one groups being opposed to the opposite surface of the other group, is very small.

By means of the invention, the number of supporting and electrical insulation parts as well as manpower needed for assembling.

As a consequence of the above, it is evident that the invention considerably reduces the total cost of the tank, as well as that of the storage and transport thereof.

Hereafter, so as to facilitate a better understanding of this description and forming an integral part thereof, a series of figures in which the object of the invention is represented in an illustrative, non-limiting way, is attached hereto.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows a schematic top plan view of a possible embodiment of the transformer of the invention. In this figure the upper surface or cover of the housing or tank of the transformer has been removed.

Figure 2 shows a side view of the transformer shown in the preceding figure, in which the lateral surface has been removed so as to clearly appreciate the arrangement of the various elements.

Figure 3 shows a view in accordance with section A-B of the preceding figure.

DESCRIPTION OF A PREFERRED EMBODIMENT OF THE INVENTION

Hereinafter, a description of the invention will be made on the basis of the aforementioned figures.

The transformer of the invention presents as a characteristic the fact that the conventional elements it is comprised of, are arranged in two differentiated groups, in such a manner that, on one side, there are situated the elements with positive voltages and, on the other, the elements with negative voltages.

For this purpose, in a longitudinal half of the transformed there are arranged: a high tension transformer

1 with its magnetic core 7, a rectifier 2, a filter 3, a capacitative divider 4 and an anode switch 5 which constitute the elements supporting positive voltages.

In the other longitudinal half, there are arranged, a high tension transformer 1' with its magnetic core 7', a a rectifier 2', a filter 3', a capacitative divider 4', and the cathode switch 5' which constitute the elements supporting negative tensions.

Between both groups, there is arranged an insulating barrier furnishing correct insulation between the two groups, whereas insulation between the various elements of each group is achieved by means of a fixing to a "zero tension" or ground level on the upper side, which is progressively increased towards the lower end in the elements with positive voltage and which progressively decreases in the elements with negative voltages; in such a way that at one same level or distance from ground level, the elements of each group have equal tensions as represented in figures 2 and 2 wherein tension levels of 0 $\pm$ 20Kv, $\pm$ 40Kv, $\pm$ 80Kv have been marked.

Hereby, the potential becomes linearly increased as from the level of 0 volts downwards, whereby the maximum level of potential is defined by the lower ends of the switches 5 and 5'.

Achievement of equipotential levels permits the elements occupying the same level of potential to be brought near to each other until almost contacting each other, as they do not need insulators and do not at all have an influence on the stray capacitance, and there are thus no limitations neither in respect of their proximity nor in respect of the opposed surfaces therebetween, so that the total volume of the transformer is considerably reduced.

Furthermore, as can be appreciated in figure 1, the surface of the elements of one group being opposed to the

opposite surface of the elements of the other group, is very small only, such that the stray capacitances are minimized.

All described elements remain included in housing 8 which is closed at its upside by cover 9 constituting the point of zero tension and wherein low tension input 10 is arranged, the latter when compared to the high tension being generated at the various levels, being negligible and can therefore be considered as zero tension level.

As has been described before in chapter Background of the Invention, the inside of the tank or housing 8 is filled with an insulating material which in the embodiment is silicone oil or mineral oil, and as a matter of example it may be pointed out that the amount of this insulator needed for filling the whole of the volume, is of 4 liters which in comparison to the 36 liters needed by conventional transformers, represents a very high reduction in volume with the subsequent saving represented thereby.

Obviously, as already stated in chapter Background of the Invention, the insulator being used can be materialized by means of vacuum encapsulating the whole of the assembly with high tension insulating silicones or resins.